TALLAHASSEE AREA
MINIMUM TEMPERATURE STUDY

Monthly Report-December 2001

National Weather Service-Tallahassee
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Introduction

During the last twelve months, The National Weather Service in Tallahassee (NWS) and the Florida State University Meteorology Department (FSU) began a joint study on minimum temperatures in the Tallahassee (Leon County) area. This study utilizes a local network of observers that is sufficiently dense to determine the pattern of minimum temperatures in the area. Once a pattern is established, the participants will attempt to determine reasons for the spatial variations in temperature (i.e. soil type, topography, other and location factors). We will also determine whether the pattern varies seasonally and with synoptic events (i.e. clear vs cloudy, cold vs warm, and wind speed and direction). Armed with this information, forecasters and broadcast meteorologists will be able to provide more accurate and more site-specific forecasts of minimum temperatures, the probability of frost and the need for freeze warnings.

This initial year has focused on developing an observer network, providing maximum- minimum thermometers as necessary, conducting site surveys, and archiving the data. This report is anticipated to be the FIRST of what will be a monthly summary sent to all members of the observer network. Each observer also will receive a summary data sheet for their specific location. Both NWS and FSU are very appreciative of your continued efforts to collect and disseminate the data. We hope you will provide feedback about the study in general, and about your site in particular. This research is an evolving process and it is expected that future reports will be more detailed as we better understand local conditions.

December 2001

Eighteen observers were participating in the study and their locations are indicated on the attached map (Fig. 1). The observer locations represent a wide spatial distribution across Leon County.

Table 1 gives the raw daily minimum data for each location in the network. These data can be used to compare your site with the others in this study. Note that December 26-28th and 13th-15th generally represent the coldest and warmest periods, respectively, and can demonstrate how changing synoptic scenarios affect minimum temperature ranges. A cold front pushed through the area on

December 24th and in its wake, strong high pressure built in locally. With the frontal passage, winds shifted from southeast to northwest, increased and became gusty. As usual in winter, the coldest temperatures occurred several nights after a frontal passage when high pressure sank southward to the local area and dry north winds subsided to near calm. Overnight NWS airport observations, December 26th-28th, indicated clear skies and unlimited visibilities each night. This set up ideal conditions for radiational cooling, and the temperatures plummeted to their lowest values. Winds here decreased from an average of 8.6 mph on December 24th to 1.7 mph on December 28th. As the high began to move east and/or south in response to the next approaching front beginning on December 29th, winds become more easterly then southeasterly and local temperatures modified.

Conversely, winds on December 13th to 15th were from the southeast to southwest, ahead of an approaching front. Overnight observations indicated onshore, relatively moist low level flow that generated patchy to dense fog with stratus ceilings generally below 500 feet. This significantly limited outgoing radiation resulting in unseasonably mild predawn lows in the 60s.

On the coldest days of the month, the Tallahassee urban heat island showed a range of ten degrees on the 26th up to 17 degrees on the 28th, This range is significant for a small city like Tallahassee, and it increases as winds decrease and radiational cooling increases. During the mildest nights, the range was only about five degrees. This implies that temperature ranges are noticeably larger during cold outbreaks.

Figure 2 is a histogram that shows how each site ranks in comparison to the other 17 sites in this December study.

Table 2, labeled “Frequency of Extremes” smooths out skewed results that are due to missing data. It is more informative than simple raw data or rank histograms, telling how many times (and the percentage) that your station ranked as one of the coldest or warmest three sites on a particular day.

Of immediate significance to forecasters, is that the Tallahassee airport is not the coldest location in the county. In fact, quite the opposite, only once (out of 31 days) did it rate as one of coldest three sites but on ten days (32.3%) it ranked as one of the three warmest sites.

Although the same locales are consistently the coldest, especially Lundy, Canopy Oaks, Binkley and Nayak in that order, the data indicate some interesting preliminary conclusions. During the day, immediately after a frontal passage when above normal and often gusty north winds prevail, those sites identified as being in the northern quadrant of the observer network are often the coldest while more southern sites, farthest from the unimpeded influence of these winds are slightly more moderated. However, several days later when winds die out

and radiational cooling dominates, there is a more even spatial distribution of cold sites. More exposed sites often reveal the coldest temperatures and the “northern bias” disappears.

Summary

This is the initial report by for the Tallahassee minimum temperature study. Since it represents only one month of data, preliminary assessments may be modified when additional data are collected. Future reports anticipate comparing the current winter data with that of last winter (and hopefully comparing all months) to strengthen our conclusions. Nevertheless, even after only one month, the data imply that the Tallahassee urban heat island is more complex and the minimum temperature ranges are more varied than previously anticipated. Future reports will investigate the reasons for these occurrences in more detail.

Figure 1: Observers Map

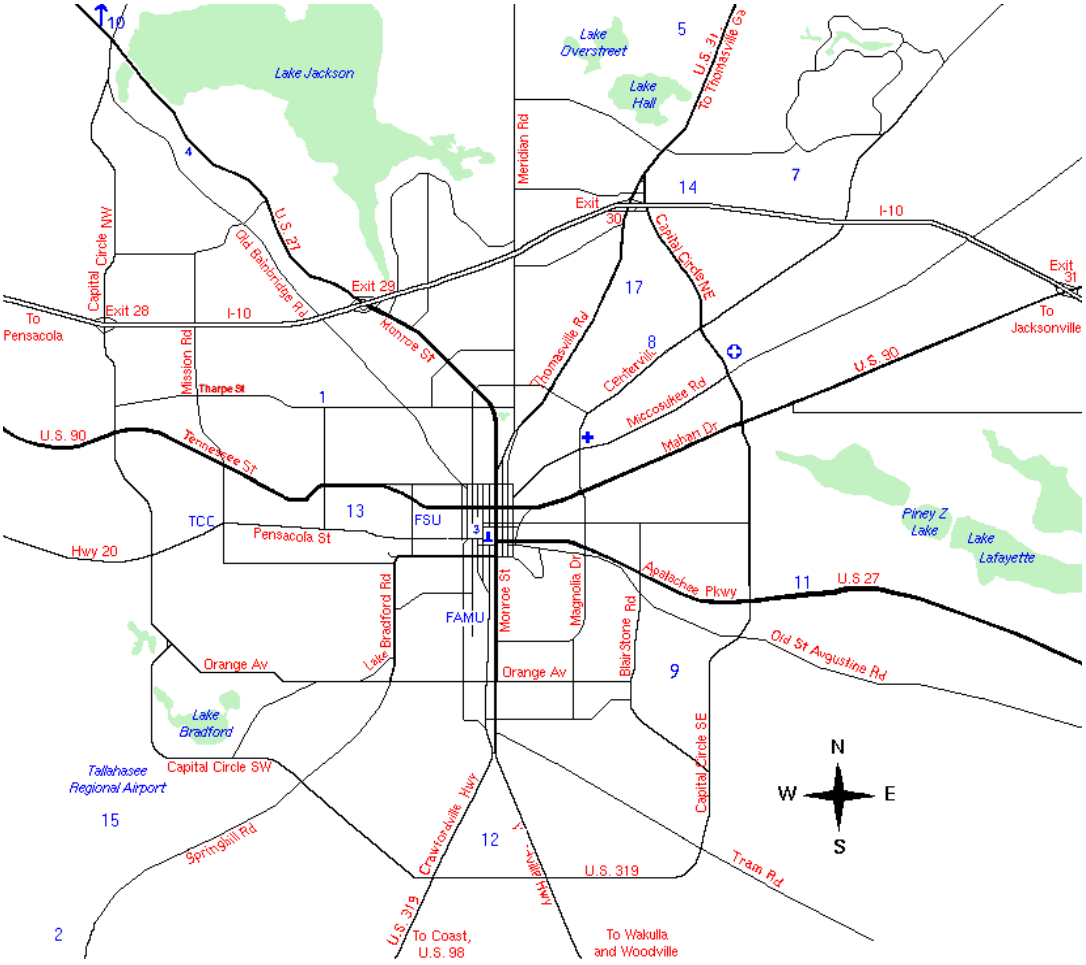

Table 1: Daily Minimum Temperature Data

Dec-01	1	2	3	4	5	6	7	8	9	10	11	12
13	14	15	16									
1.Bellenot	56	50	52	53	57	58	60	61	61	62	55	57
66	65	66	60									
2.Binkley	52	42.6	41.2	46.4	46.6	50.2	52.5	45.1	61	59.4	57.2	58.1
	61	65.3	61.9	59.4								
3.Brogan	58	53	54	54	58	61	64	65	64	63	57	58
66	65	67	64									
4.Canopy	51	42	43	47	46	50	53	57	57	56	50	54
	61	59	57									
5.Chiles	50	43	43	47	47	52	53	53	57	55	50	53
62												
6.Elsner	58	47	47	51	51	54	56	59	62			
		66	60									
7.Fiorino	51.7	45.2	43.1	47.6	47.4	50.5	54.5	56.7	61.4	57.2	55.3	57.7
	63.3	65.3	61.1	58.9								
8.Fuelberg	58	47	48	51	51	55	57	58	62	61	56	57
66	65	66	60									
9.Lericos	68	58	48	52	52	57	57	68	62	59	55	56
64	62	66	60									
10.Lundy	54	43	40	44	45	48	51	56	58	56	53	57
62	61	60	58									
11.Nayak			47	49	52	54		57	61	58	55	55
63	61	61	58									
12.Oak R.	50	43	42	49	52	54	52	55	61	59	54	55
	61	61	58									
13.Sharp		44	45.5	52	52	56	56	58	61.5	62		56
63	63	65.5										
14.Stuart	58	48	50	51	54	56	58	60	60	60	54	56
64	64											
15.TLH	56	44	43	49	47	50	54	58	63	61	57	58
66	64	66	59									
16.Wakulla	56	49	47	57	52	53	57	59	65	62	59	58
66	67	66	64									
17.Watson	53	46	47	50	50	54	56	57	60	58	56	56
	61	61	60									
18.WCTV	55	43	44	49	47	52	54	55	57	58	52	55
	63	61	55									
Average	55.29	46.34	45.82	49.94	50.38	53.59	55.58	57.65	60.77	59.21	54.71	56.2
8	64.02	63.35	63.40	59.42								
St. Dev.	4.453	4.288	3.773	3.083	3.714	3.287	3.217	4.727	2.306	2.393	2.512	
1.519	1.813	1.993	2.821	2.322								

Dec-01	17	18	19	20	21	22	23	24	25	26	27	28
29	30	31										
1.Bellenot	66	50		43	40	42	50	42	39	28	29	34
43	39	36										
2.Binkley	64.4	46.4	35.6	37.2	26.2	29.6	39.2	38.8	36.7	23.2		20.9
	37.8	36.7	29.5									

3.Brogan	66	56	49	46	44	45	56	45	43	33	35	42
48	41	39										
4.Canopy		46	38	39	33	31	41	39	36	24	22	27
36	33	30										
5.Chiles		42	38									
6.Elsner	65		42	44	37	45		43	40	30	24	30
42	39	35										
7.Fiorino	62.6	44.8	39.9	38	31.5	31	41.9	40.2	39.9	27.5	25	28.2
	38.9	32	32									
8.Fuelberg	65	52	43	43	37	35	44	43	40	30	27	30
41	40	35										
9.Lericos	64	48	43	45	46	38						31
43	40	36										
10.Lundy	60	48	37	37	28	29	39	40	35	24	21	25
36	33	29										
11.Nayak	63	49	41									
12.Oak R.	62	42	37	40	31	30	43	42	38		22	25
36	37	30										
13.Sharp	60	47	38.5	38	34	35				25	23	27
39		32										
14.Stuart												
15.TLH	65	51	38	44	31	31	41	47	41	27	24	27
38	41	31										
16.Wakull	69	46	42	42	32	34	44	45	41	31	27	31
42	41	35										
17.Watson	64	46	42	42	39	34	42	43	40	28	26	29
	39	33										
18.WCTV	62	43	38	39	32	34	46	40	37	24	24	26
37	34	31										
Average	63.86	47.32	40.12	41.14	34.78	34.90	43.92	42.15	38.96	27.28	25.30	28.8
7	39.83	37.55	32.9									
St. Dev.	2.373	3.737	3.340	3.001	5.631	5.338	4.855	2.519	2.292	3.117	3.705	
4.803	3.493	3.279	2.953									

Summary Data for December 2001

Mr. Ron Block: NWS Tallahassee

Average Minimum: 47.5
Coldest Minimum: 24
Date: 12/27
Warmest Minimum: 66
Date: 12/13 and 12/15
Total Number of Freezes: 6

Days With Observations: 31
Missing Days: 0

Figure 2: Rank Histogram

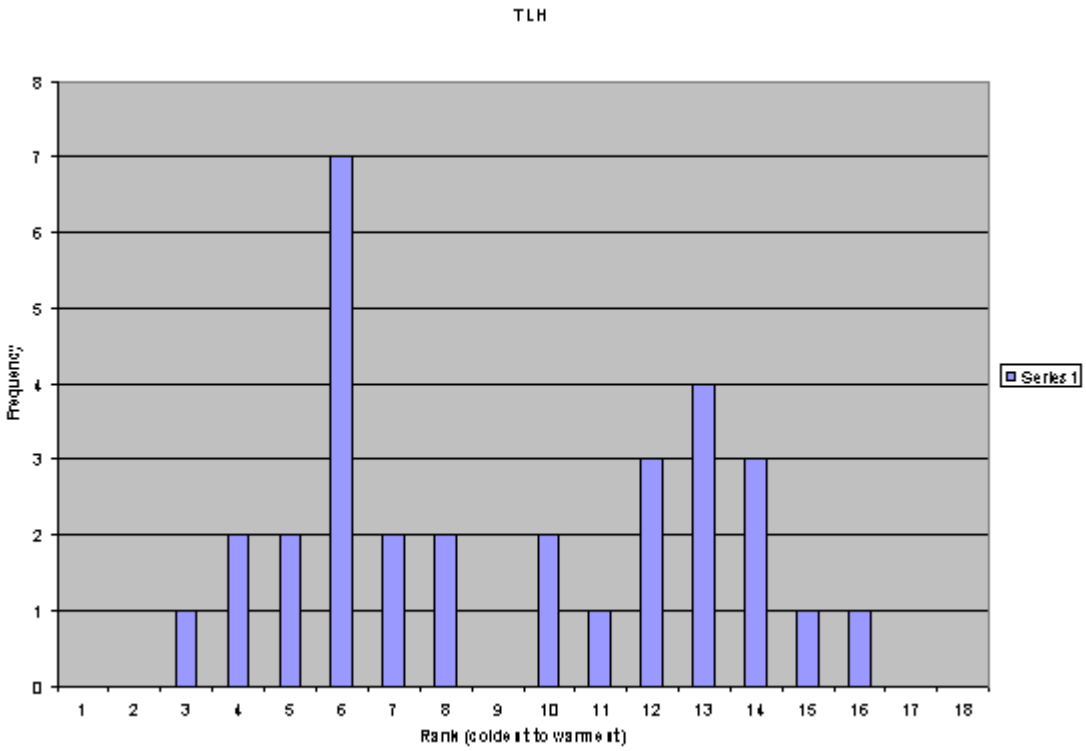

Table 2: Frequency of Extremes

Site	Total Obs		Coldest 3	Warmest 3	% in Coldest 3	% in Warmest 3
Bellenot	30	0	14	0	46.7	
Binkley	30	17	3	56.7	10	
Brogan	31	0	26	0	83.9	
Canopy	29	20	0	69	0	
Chiles HS	14	9	0	64.3	0	
Elsner	24	0	1	0	4.2	
Fiorino	31	2	0	6.5	0	
Fuelberg	31	0	5	0	16.1	
Lericos	26	0	8	0	30.8	
Lundy	31	24	0	77.4	0	
Nayak	16	3	0	18.8	0	
Oak Ridge	29	12	0	41.4	0	
Sharp	24	1	1	4.2	4.2	

Stuart	14	0	4	0	28.6
TLH	31	1	10	3.2	32.3
Wakulla	31	0	16	0	51.6
Watson	30	0	1	0	3.3
WCTV	30	4	1	1.3	3.3